ORDER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

8110.46

9/30/02

SUBJ: **MAJOR ALTERATIONS THAT REQUIRE SUPPLEMENTAL TYPE CERTIFICATES**

1. PURPOSE. This order clarifies guidance in FAA Order 8110.4, Type Certification. The order is intended for Aircraft Certification Office (ACO), Flight Standards Office (AFS) staff, Management Designated Airworthiness Representative (MDAR), and designees. It will help them decide what major alteration projects, by major product type (General Aviation, Transport Airplane, Engines and Propellers, Rotorcraft) need a Supplemental Type Certificate (STC). This order will also help them decide whether to use two other approval means: approval by Designated Engineer Representative (DER) submitted data, or an engineering-coordinated field approval. Any decisions on field approvals being currently made must comply with this order.

2. DISTRIBUTION. Distribute this order to the branch level of Washington headquarters for Aircraft Certification; to the branch level in the Aircraft Certification Directorates; to the Flight Standards Aircraft Maintenance Division; to all Flight Standards District Offices; to all Aircraft Certification Offices (ACO); to the Aircraft Certification Branch at the FAA Academy; to the Brussels Aircraft Certification Division; to all Flight Standards International Field Offices; and to all MDARs, Designated Airworthiness Representatives (DARs) and DERs.

3. WHY WE NEED THIS ORDER. We have noted, over time, some inconsistency and lack of standardization in the way Flight Standards District Offices issued field approvals. In some instances, inspectors issued field approvals when the product should have received an STC. This order, when used by the MDAR, designees, and inspectors, will ensure that we will better identify alteration projects that need to be referred to the ACO as potential STC projects.

4. WHAT IS IN THIS ORDER. This order contains lists derived from the Flight Standards Service (AFS) Order 8300.10, "Airworthiness Inspector's Handbook." The handbook describes complex alterations that exceed the basic scope of a Field Approval. The lists also describe alterations that "could be approved by other means than an STC." This means that sufficient data supporting major alterations to type certificated products can be used as a means of approval other than by Field Approval, type certificate changes or STCs (see FAA Order 8110.45, Use of Data Approved by Designated Engineering Representatives to Support Major Alterations).

Distribution: A-W(IR/FS)-3; A-X(CD)-2; A-FFS-0(ALL); A-FAC-0(ALL); AEU-100; FDR-2; A-FFS-620(25 copies)

Initiated By: AIR-110

5. TWO OTHER APPROVAL MEANS.

a. FAA Form 337 documents the change and data used to support a Field Approval. Although DERs are not authorized to approve Block 3 of Form 337, this does not prevent DER approved data from being used as a basis for an alteration in support of Form 337. However, when sufficient DER approved data has been obtained and that data addresses all the requirements of Title 14, Code of Federal Regulations (CFR) parts 21 and 43, the approval process applicable to the alteration is complete. The product then can be inspected for conformity and returned to service without a further finding by an ASI under Block 3 on Form 337. It is necessary that all affected disciplines be addressed by approved data. The person performing the alteration is then responsible for conforming and approving for return to service the installation, not the DER.

b. The other means is that the ACO could advise the Flight Standards District Office (FSDO) that a coordinated Field Approval could be accomplished.

6. HOW TO COMPLY WITH THIS ORDER.

a. From here on, we divided this order into four sections, which are paragraphs **7** through **10**, one for each product: general aviation, rotorcraft, engines and propellers, and transport airplanes. Each section/paragraph lists the important changes to an aircraft under seven categories: weight and balance, structural strength, reliability, operational characteristics, airworthiness, crashworthiness, and unique or complex installation.

b. You do not need a copy of Order 8300.10 to use this order. We have extracted the lists from the Handbook and identified by asterisks which alterations, by respective product line, could be approved by other means than an STC. We have also added descriptions of alterations we feel should be potential STC projects.

c. During the review of a Field Approval project, the MDAR, DER, and ASI must consider the following lists for the respective product type, and take appropriate action to either pursue a field approval or contact the ACO for further action. The designee or FSDO Inspector must notify the ACO if the project is deemed to be one required for engineering assistance or an STC.

d. Any additional items to Order 8300.10, Airworthiness Inspector's Handbook, follow in numerical order and are described under the respective sections.

e. An asterisk-marking scheme indicates those items that, while corresponding to the Order 8300.10 Airworthiness Inspector's Handbook categorization, could be approved by a means other than an STC, *or* may not be appropriate for the product section. Consult *each* section that concerns your product. The legend is as follows:

NOTE: * These items could be approved by other means than an STC.
**** Not applicable for this product in this section, but addressed in appropriately identified product section.**

7. GENERAL AVIATION AIRCRAFT. This aircraft has a certification basis of 14 CFR parts 23 and 31, or Joint Aviation Regulation (JAR) 22. We require STCs for the following:

a. Weight and Balance. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes that increase the certificated maximum weight limits (increases in the maximum gross weight, maximum take-off, or landing weights).

(2) Changes in the certificated center of gravity range limits (for example decreasing the forward limit or increasing the aft limit).

(3) Changes that increase the operational limits (maximum speed limits such as V_A, V_{FE}, V_{NE}; minimum speed limitations such as stall speed; increases in service ceiling, and so forth).

b. Structural Strength. Typical alterations that may appreciably affect this include:

(1) Changes to primary structures (structure that carries flight, ground, or pressure loads as defined in AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure). *

(2) Substituting an engine, propeller, rotor or airframe primary structural materials (such as replacing a reciprocating engine with a turbine engine or increasing horsepower output by 10% or more).

c. Reliability. Typical alterations that may appreciably affect this include:

(1) Changes to manifolding, air induction systems or air intake doors, engine cowling or baffle that affect the flow of engine cooling air and carburetor/fire ignition heat rises. *

(2) Changing the basic engine or propeller design, controls, and operating limitations. *

(3) Changes that include engine/propeller adjustments and settings limitations that affect power output.*

(4) Modifications to approved avionics equipment that affect reliability or airworthiness, such as changes:

- Deviating from the design environment performance.*
- Deviating from the component manufacturer's operating limitations.*
- To software.*
- To wire shielding that may affect High Intensity Radiated Fields (HIRF) and Electromagnetic Interference(EMI).*

d. Operational Characteristics. Typical alterations that may appreciably affect this include:

(1) Changes or relocation of systems (including hydraulic, oil, and fuel systems) and equipment that affect structural integrity, flight, ground handling characteristics, or noise/acoustics of the aircraft. *

(2) Changes that alter the movable control surfaces that affect the dynamic and/or static balance, alter the aerodynamic contour of movable control surfaces, or change the weight distribution.

(3) Changes in control surface travel, control system mechanical advantage, location of control system component parts, or direction of motion.

(4) Changes in basic dimensions or external aerodynamic contour/configuration of the aircraft such as wing and tail planform or incidence angles, canopy, cowlings, contour or radii, the location of wing and tail fairings, winglets, wing lift struts, tiptanks, windows, and doors.

(5) Installation of structure and/or appliances to the exterior (that is, night sun beacon, camera, spray/dusting equipment) on rotorcraft only.**

(6) Changes to flight-critical electrical/electronic systems such as electronic flight controls or the engine control system, Full Authority Digital Engine Control (FADEC), fly by wire, and so forth.

(7) Changes that affect aircraft performance, drag, engine power, revolutions per minute (RPM), or exhaust muffler.*

(8) Changes affecting noise or flight characteristics.*

(9) Rotorcraft items, such as external search lights, skis, baskets, and so forth.**

e. Airworthiness. Typical alterations that may appreciably affect the airworthiness include:

(1) Changes to landing gear and related components, such as internal parts of shock struts, length, geometry of members, changes to brake and brake systems, or additions.*

(2) Changes to systems that affect aircraft airworthiness, such as:

- Relocation of exterior fuel vents or battery vents. *
- Crew or passenger liquid oxygen (LOX) or on-board generating systems.*
- External critical access doors, Auxiliary Power Unit (APU) ram air, nacelle blowout doors, fuel drain.*

(3) Major Deviations to STCs.*

(4) Changes to oil, hydraulic, pneumatic, and fuel lines or systems that affect their operation or installation and flammability requirements, such as:

- New types of hoses and/or hose fittings that may not meet installation requirements such as flow rate and flammability requirements.*
- Changes to fuel dump valves. *
- New oil/fuel/hydraulic line materials or sealants. *
- Change to, or addition of, permanent fuel tanks or fuel system components. *

(5) Changes in fixed fire extinguisher or detector systems that affect system effectiveness or reliability, such as:

- Relocation of discharge nozzles, detector units, or fixed fire extinguisher bottles.*
- Using new or different detector components.*
- Decreasing the amount or changing the type of extinguishing agents.*

(6) Changes that include the substitution of engine/APU/propeller/airframe materials that affect structural integrity, lightning protection, flight characteristics, or noise/acoustics.*

(7) Any other complex special process that, if not properly performed, has a significant adverse effect on the integrity of the product.*

(8) Major alterations to propellers.**

f. Crashworthiness. Typical alterations that may appreciably affect crashworthiness include, but are not limited to:

(1) Changes to the aircraft structure, cabin interiors, or equipment relocation.*

(2) Changes that increase the certificated seating capacity, excluding sport parachute jumping configuration.*

(3) Changes that include the substitution of engine/propeller/airframe materials that affect fire protection, lightning protection, or flammability.*

g. Other alterations requiring an STC or supported by other methods as described in Section 5 above (that is, Form 337 data approval method or coordinated Field Approval), unless specifically identified by the Administrator as a candidate for the field approval process, includes:

(1) Installing equipment used for primary means of navigation, such as heads-up displays, Traffic Alert and Collision Avoidance System (TCAS), autopilots, flight data recorder (FDR), ground proximity warding systems (GPWS), electronic flight instrument service (EFIS), Terrain Awareness and Warning System (TAWS)-A, and Emergency Vision Assurance System (EVAS), not previously approved on aircraft of a same type model.

(2) Changes in engine or flight control systems.

(3) Installing new, or modifying existing, icing protection systems.

(4) Changes that alter dynamic components of rotorcraft (for example loads, vibration, fatigue, damage tolerance, flaw tolerance, characteristics of main or tail rotor system, transmission system, gearbox, driveshafts, driveshaft support bearings, main and tail rotor blades.)**

(5) Changes to TSO articles that do not meet the minimum standards of the TSO.*

(6) Changes that alter critical or life-limited parts, including engine/APU rotating parts.

(7) Changes inconsistent with the required actions of an AD.*

(8) Changes that alter systems required for Extended Twin Engine Operations (ETOPS) of approved aircraft.*

(9) Changes that increase the differential pressure limits of an atmospheric or climatic control system of aircraft interior compartments.*

(10) Alteration of passenger-carrying aircraft to an all-cargo or combi configuration.

NOTE: * These items could be approved by other means than an STC.
**** Not applicable for this product in this section, but addressed in appropriately identified product section.**

8. ROTORCRAFT. The following section applies to aircraft with a certification basis of 14 CFR parts 27, 29, or Civil Aviation Manual (CAM) 7 or 9.

a. Weight and Balance. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes that increase the certificated maximum weight limits affecting structural, performance, handling qualities, and so forth (for example, increases in the maximum gross weight, maximum take-off weight or landing weight).

(2) Changes in the certificated center of gravity range limits (for example, decreasing the forward limit or increasing the aft limit).

(3) Changes that increase the operational limits; for example, maximum speed limits such as V_A, and V_{NE}; minimum speed limitations, such as Vmin; or increases in service ceiling, and so forth.

(4) An additional item apart from the Airworthiness Inspector's Handbook includes changes that cause the "empty" weight and center of gravity of the rotorcraft to deviate from maintenance manual limits (or guidance), and may require a change to the flight manual loading tables.

b. Structural Strength. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes to primary structures (structure that carries flight, ground, or pressure loads as defined in AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure) as well as the following **additional** modifications or structural members:

- Installation of significant structure and/or appliances to the exterior of the aircraft (such as night sun beacons, camera, firefighting, spray and dusting equipment).

- Changes to landing gear and related system and structural components, including wheels, brakes, and tires.

- Internal frame, longeron or structural members.
- Consideration of flutter and vibration for any of the aforementioned changes.

(2) Substituting engine, propeller, rotor, or airframe primary structure materials.

(3) Additional items, apart from the Airworthiness Inspector's Handbook, include:

- Changes to structural panels and load bearing components that could affect service life.

- Changes that could have significant effect on the manufacturing process, including materials, processes, coatings, and so forth.

- Installation of Health Usage Monitoring Systems (HUMS).

- Installing systems that extract power from drive systems, such as air conditioning power drawn from the tail rotorshaft.

c. Reliability. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes to manifolding, air induction systems or air intake doors, engine cowling or baffle that affect the flow of engine cooling air and carburetor/fire ignition heat rises.

(2) Change to the basic engine or propeller design, controls, operating limitations.

(3) Changes that include engine/propeller adjustments and setting limitations that affect power output.

(4) Modifications to approved avionics equipment that affect reliability or airworthiness, such as changes:

- Deviating from the design environment performance.*
- Deviating from the component manufacturer's operating limitations.*
- To software.*

- To wire shielding that may affect High Intensity Radiated Fields (HIRF) and Electromagnetic Interference (EMI).*

d. Operational Characteristics. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes or relocation of systems (including hydraulic, oil and fuel systems) and equipment that affects structural integrity, flight, ground handling characteristics or noise/acoustics of the aircraft.

(2) Changes that alter the movable control surfaces that affect the dynamic and/or static balance, alter the aerodynamic contour of moveable control surfaces, or the weight distribution.*

(3) Changes in control surface travel, control system mechanical advantage, location of control system components parts, or direction of motion.*

(4) Changes in basic dimensions or external aerodynamic contour/configuration of the aircraft such as wing and tail planform or incidence angles, canopy, cowlings, contour or radii, the location of wing and tail fairings, winglets, wing lift struts, tiptanks, windows, and doors.*

(5) Installing structure and /or appliances to the exterior (that is, night sun beacon, camera, spray/dusting equipment) on rotorcraft only.

(6) Changes to flight-critical electrical/electronic systems, such as electronic flight controls or engine control system, FADEC, fly by wire, and so forth.

(7) Changes that affect aircraft performance, drag, engine power, RPM, or exhaust muffler.

(8) Changes affecting noise or flight characteristics.

(9) Changes to other rotorcraft items such as to external search lights, skis, baskets, and so forth.*

e. Airworthiness. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes to landing gear and related components, such as internal parts of shock struts, length, geometry of members, changes to brake and brake systems, or additions.*

(2) Changes to systems such as:

- Relocation of exterior fuel vents or battery vents. *
- Crew or passenger liquid oxygen (LOX) or on-board generating systems. *
- External critical access doors, APU ram air, nacelle blowout doors, fuel drain.*

(3) Major deviations to STCs.*

(4) Changes to oil, hydraulic, pneumatic and fuel lines, systems or their components that affect their operation or installation and flammability requirements, such as:

- New types of hoses and/or hose fittings which may not meet installation requirements, such as those of flow rate and flammability.
- Changes to fuel dump valves.
- New oil/fuel/hydraulic line materials or sealants.
- New fuel tanks or fuel system components.

(5) Changes in fixed fire extinguisher or detector systems that affect the system's effectiveness or reliability, such as:

- Using new or different detectors.
- Decreasing the amount, or changing the type of extinguishing agents.
- Relocating discharge nozzle, detector units or fixed fire extinguisher bottles.

(6) Changes that include substituting engine/propeller/ airframe materials that affect structural integrity, lightning protection, flight characteristics, or noise/acoustics.

(7) Any other complex special process that, if not properly performed, has a significant adverse effect on the integrity of the product.

(8) Major alterations to propellers.**

f. Crashworthiness. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes to the aircraft structure cabin interiors, or equipment relocation that affect crashworthiness and/or emergency evacuation. This includes initial installation or relocation of seats or litter systems.

(2) Changes that increase the certificated seating capacity.

(3) Changes that include substituting engine/propeller/airframe materials that affect fire protection, lightning protection, or flammability.

g. Other alterations requiring an STC or supported by other methods as described in Section 5 above (i.e. Form 337 data approval method or coordinated Field Approval), unless specifically identified by the Administrator as a candidate for the field approval process, include:

(1) Installing equipment used for primary means of navigation (or advisory in function) such as heads-up displays, TCAS, autopilots, flight data recorders (FDR), Ground Proximity Warning Systems (GPWS), EFIS, TAWS-A, and Emergency Vision Assurance System (EVAS).

(2) Changing engine or flight control systems.

(3) Installing new, or modifying existing, icing protection systems.*

(4) Changes that alter dynamic components of rotorcraft, such as loads, vibration, fatigue, damage tolerance, flaw tolerance, characteristics of main or tail rotor system, transmission system, gearbox, drive shafts, driveshaft support bearings, main and tail rotor blades.

NOTE: RPM changes of main and tail rotor may affect handling performance characteristics and/or noise or acoustics.

(5) Changes that do not conform to the minimum standards in a Technical Standard Order (TSO), under which a particular aircraft component or appliance is manufactured.

(6) Changes to a critical or life-limited part, including engine/APU rotating parts.

(7) Changes to an area subject to an FAA Airworthiness Directive (AD).

(8) Changes that alter systems required for Extended Twin Engine Operations (ETOPS) of approved aircraft.**

(9) Changes that increase the differential pressure limits of an atmospheric or climatic control system of aircraft interior compartments.*

(10) Alteration of passenger-carrying aircraft to an all-cargo or combi configuration.

(11) Additional items, apart from the Airworthiness Inspector's Handbook, include:

- Changes that may require a human factors compliance finding, for example, in flight deck instrumentation and controls.
- Installation or changes that alter the electrical systems (including batteries) that affect electrical loading and fault clearing capability.
- Flight deck lighting changes to support Night Vision Goggle use, or any approvals related to Night Vision Goggles.
- Changing, or substituting, engine/aircraft instrumentation required by a unique characteristic of the particular type design.

NOTE: * These items could be approved by other means than an STC.
**** Not applicable for this product in this section, but addressed in appropriately identified product section.**

9. ENGINES, PROPELLERS AND APUs. The following list applies to engines certificated under 14 CFR parts 33, 34 and 36 or JAR E, propellers certificated under 14 CFR part 35 or JAR P, or APUs approved under TSO-C77a.

a. Weight and Balance. Typical alterations that may affect this include, but are not limited to:

(1) Changes that increase the certificated maximum weight limits (for example, increases in the maximum gross weight, maximum take-off or landing weights).

(2) Changes in the certificated center of gravity range limits (for example, decreasing the forward limit or increasing the aft limit).

(3) Changes that increase the operational limits; for example, maximum speed limits such as V_A, V_{FE}, V_{NE}, minimum speed limits such as Vmin, or increases in service ceiling.

(4) Additional items apart from the Airworthiness Inspector's Handbook include changes that alter the dynamic or/and static balance of movable or rotating parts or components.

b. Structural Strength. Typical alterations that may affect this include, but are not limited to:

(1) Changes to primary structures (structure, casings, mounts, bearing support structure, and pressure vessels).

(2) Substitution of engine, propeller, rotor or airframe structure materials.

c. Reliability. Typical alterations that may affect this include, but are not limited to:

(1) Changes to manifolding, air induction systems or air intake doors, engine cowling or baffles that affect the flow of engine cooling air and carburetor/fire ignition heat rises.

(2) Change to the basic engine or propeller design, controls, operating limitations.

(3) Changes to engine/propeller adjustments and setting limitations that affect power output.

(4) Modifications to approved avionics equipment that affect reliability or airworthiness, such as:

- Deviations from the design environment performance.
- Deviations from the component manufacturer's operating limitations.
- Changes to software.
- Changes to wire shielding that may affect High Intensity Radiated Fields (HIRF) and Electromagnetic Interference (EMI).

d. Operational Characteristics. Typical alterations that may affect this include, but are not limited to:

(1) Changes or relocation of systems (including hydraulic, oil, and fuel systems) and

equipment that affect structural integrity, flight, ground handling characteristics, or noise/acoustics of the aircraft in general.**

(2) Changes that alter the moveable control surfaces that affect the dynamic and/or static balance, alter the aerodynamic contour of moveable control surfaces, or change the weight distribution.**

(3) Changes in control surface travel, control system mechanical advantage, location of control system component parts or direction of motion.

(4) Changes in the basic dimensions or external aerodynamic contour/ configuration of the aircraft, such as wing and tail planform or incidence angles, canopy, cowlings, contour or radii, the location of wing and tail fairings, winglets, wing lift struts, tiptanks, windows, and doors.**

(5) Installing structures and/or appliances to the exterior (that is, night sun beacon, camera, spray/dusting equipment) on rotorcraft only.**

(6) Changes to flight-critical electrical/electronic systems such as electronic flight controls or the engine control system, FADEC, fly by wire, and so forth.

(7) Changes that affect aircraft performance, drag, engine power, RPM, or exhaust muffler.

(8) Changes that alter the aerodynamic contour that affects noise or flight characteristics.

(9) Rotorcraft items such as external search lights, skis, baskets, and so forth. **

(10) Additional engine and APU specific alterations apart from those cited in the Airworthiness Inspector's Handbook include:

- Changes increasing the approved ratings or operational limits.
- Changing the engine, propeller, or APU design, controls, operating limitations.
- Changing engine, propeller or APU adjustments and setting limitations that have an affect on power output or control functions.
- Changes that alter the aerodynamic contour of any blades, vanes, or internal or external aerodynamic surfaces.
- Changes affecting aircraft, engine or propeller performance, drag, power, RPM, inlet induction or exhaust.
- Changes altering dynamic components of any power transmission system

such as loads, vibration, fatigue, damage tolerance, flaw tolerance, characteristics of rotor system and power transmission system, gears, drive shafts, driveshaft support bearings.

- Changes altering any systems requirements for ETOPS of approved aircraft.

e. Airworthiness. Typical alterations that may affect this include, but are not limited to:

(1) Changes to landing gear and related components, such as internal parts of shock struts, length, geometry of members, changes to brake and brake systems, or additions. **

(2) Changes to systems that affect airworthiness, such as:

- Relocation of fuel vents or drains.
- Using new or different hydraulic components, generators, starters, magnetos, pumps, turbo or superchargers.
- Tube material and fittings not previously approved.
- External critical access doors, APU ram air, nacelle blow out doors, bleed ports and doors, and so forth.

(3) Major deviations to STCs.*

(4) Changing oil, hydraulic, pneumatic and fuel lines, systems or their components that affect their operation or installation and flammability requirements of the engine or APU, such as:

- New types of hoses and/or hose fittings which may not meet the installation requirements, such as those for flow rate and flammability.
- New oil/fuel/hydraulic line materials or sealants.
- New flammable fluid tanks or system components.

(5) Changes in fixed fire extinguisher or detector systems that affect the system's effectiveness or reliability, such as:

- Relocating the discharge nozzle, detector units or fixed fire extinguisher bottles.
- Using new or different detector components.
- Decreasing the amount, or changing the type of extinguishing agents.

(6) Changes that include substituting engine/APU/propeller/airframe materials that affect structural integrity, lightning protection, flight characteristics, or noise/acoustics.

(7) Any other complex special process that, if not properly performed, has a significant adverse effect on the integrity of the product.

(8) Major alterations to propellers.

(9) Additional items apart from the Airworthiness Inspector's Handbook include:

- Any change affecting parts, or in the immediate vicinity of parts, affected by an AD.
- Changes to any parts affected by an Airworthiness Limitation.

f. Crashworthiness. Typical alterations that may affect this include, but are not limited to:

(1) Changes to the aircraft structure, cabin interiors, or equipment relocation that affect crashworthiness. *

(2) Changes that increase the certified seating capacity, excluding sport parachute jumping configuration. **

(3) Changes that include substituting engine/propeller/airframe materials affecting fire protection, lightning protection, or flammability.

g. Other alterations requiring an STC or supported by other methods as described in Section 5 above (i.e. Form 337 data approval method or coordinated Field Approval), unless specifically identified by the Administrator as a candidate for the field approval process, include:

(1) Installing equipment for primary means of navigation, such as heads-up displays, Traffic Alert and Collision Avoidance System (TCAS), autopilots, flight data recorder (FDR), ground proximity warding systems (GPWS), electronic flight instrument service (EFIS), Terrain Awareness and Warning System (TAWS)-A, and Emergency Vision Assurance System (EVAS), not previously approved on aircraft of a same type model. **

(2) Changes in engine or flight control systems.

(3) Installing new or modifying existing icing protection systems.

(4) Changes that alter dynamic components of rotorcraft such as loads, vibration, fatigue, damage tolerance, flaw tolerance, characteristics of main or tail rotor system, transmission system, gearbox, driveshafts, drive support bearings, main and tail rotor blades. **

(5) Changes to TSO articles that do not meet the minimum standards of the TSO.

(6) Changes altering critical or life-limited parts, including engine/APU rotating parts. This is included and expanded under item (11) below.

(7) Changes inconsistent with the required actions of an existing AD. Changes that alter an area subject to an AD.

(8) Changes that alter systems required for ETOPS approved aircraft.

(9) Changes that increase the differential pressure limits of an atmospheric or climatic control system of aircraft interior compartments.**

(10) Alteration of passenger-carrying aircraft to an all-cargo or combi configuration.**

(11) Additional items apart from the Airworthiness Inspector's Handbook specific to engines and APUs are:

(a) Changes altering critical or life limited parts, or that affect any airworthiness limitation for engine, propeller or APU rotating parts.

(b) Mating a new propeller to an engine, or vice versa.

(c) Modifying approved avionics equipment, such as:

- Deviating from the design environmental performance compliance requirements.
- Deviating from the component manufacturer's operating limitations.
- Changes to software.
- Changes to wire shielding or components that may affect HIRF, EMI, or lightning compliance.
- Changing flight-critical electrical/electronic systems, such as electronic flight controls or engine, propeller or APU control systems such as FADEC, or fly by wire.
- Changes that include substituting engine/propeller/APU materials that affect structural integrity, fatigue capability, fire protection, HIRF/lightning protection, flight characteristics, or noise/acoustics.
- Changing or substituting engine, propeller, or APU instrumentation.
- Changes that do not conform to the minimum standards in a TSO under which a particular component or appliance is manufactured.
- Changes that may require a human factors compliance finding.
- Installation or changes affecting the electrical systems and electrical loading (and load shedding characteristics) of the engine or APU.
- Changes to or relocation of any systems (including hydraulic, oil and fuel systems) and equipment that affects structural integrity, operability characteristics, noise/acoustics, or emissions and fuel venting.

- Changes to manifolding, air induction systems or air intake doors, engine cowling or baffle that affect the flow of engine cooling air, carburetor, fire ignition heat rises, or under-cowl clearances.

- Changes to any components that affect icing compliance.

NOTE: * These items could be approved by other means than an STC.
**** Not applicable for this product in this section, but addressed in appropriately identified product section.**

10. TRANSPORT AIRPLANES. The following list applies to airplanes certificated under 14 CFR part 25 not operating under part 121 operating rules with a maximum zero fuel weight of 75,000 lbs or less. If the modifications to a 14 CFR part 25 transport category aircraft will affect any of the categories below, we may require an STC.

a. Weight and Balance. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes that increase the certificated maximum weight limits (maximum gross weight, maximum take-off or landing weights, and maximum zero fuel weight).

(2) Changes in the certificated center of gravity range limits (for example, decreasing the forward limit or increasing the aft limit).

(3) Changes that increase the operational limits (maximum speed limits such as V_A, V_{FE}, V_{NE}, V_{MO} and V_{MMO}, minimum speed limitations such as stall speed, and increases in service ceiling.)

b. Structural Strength. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes to principal or primary structural elements (principal elements that carry flight, ground, or pressure loads) defined by AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure.

(2) Substituting engine, propeller, rotor, or airframe primary structure materials.

(3) An additional item apart from the Airworthiness Inspector's Handbook includes an alteration that creates principal structural elements.

c. Reliability. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Significant changes to manifolding, air induction systems or intake doors, engine cowling or baffle that affect the flow of engine cooling air.

(2) Changing the basic engine or propeller design, controls, and operating

limitations.

(3) Changes that include engine/propeller change to the adjustments and setting limitations.

(4) Modifying approved avionics equipment that affect reliability or airworthiness, such as changes:

- Deviating from the design environmental performance. *
- Deviating from the component manufacturer's operating limitations.*
- To software.*
- To wire shielding that may affect High Intensity Radiated Fields (HIRF) and Electromagnetic Interference (EMI). *

(5) An additional item, apart from the Airworthiness Inspector's Handbook, includes changing electrical, pneumatics, and hydraulic systems components.

d. Operational Characteristics. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes or relocation of systems (including hydraulic, oil, and fuel systems) and equipment that affects structural integrity, flight, ground handling characteristics, or noise/acoustics of the aircraft.*

(2) Significant changes to the movable control surfaces that affect the dynamic and/or static balance, alter the aerodynamic contour of movable control surfaces, or change the weight distribution.

(3) Changes to control surface travel, redesigning the method of control system mechanical advantage, or direction of motion.

(4) Changes in basic dimensions or external aerodynamic contour/configuration of the aircraft, such as wing and tail planform or incidence angles, canopy, cowlings, contour or radii, the location of wing and tail fairings, winglets, wing lift struts, tiptanks, windows, and doors that would require flight or performance revalidation.

(5) Installing structures and/or appliances to the exterior such as night sun beacons, camera, spray/dusting equipment on rotorcraft only.**

(6) Installing new flight critical electrical/electronic systems, electronic flight controls or engine control systems such as FADEC and fly-by-wire.

(7) Changes that affect aircraft performance, drag, engine power, RPM, or exhaust muffler.

(8) Changes that alter the aerodynamic contour that affect noise or flight characteristics.*

(9) Rotorcraft items, such as external search lights, skis, baskets, and so forth.**

(10) An additional item apart from the Airworthiness Inspector's Handbook, is change or relocation of systems (including hydraulic, oil, and fuel systems) and equipment that affect structural integrity, flight, ground handling characteristics, flammability, or noise/acoustics of the aircraft.

e. Airworthiness. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes to landing gear and related components, such as internal parts of shock struts, length, geometry of members, changes to brake and brake systems, or additions.*

(2) Changes to systems that affect airworthiness such as:

- Relocation of fuel vents or drains.*
- Crew or passenger liquid oxygen (LOX) or on-board generating systems.*
- External critical access doors, APU ram air, nacelle blowout doors, fuel drain.*

(3) Major deviations to STCs.*

(4) Changes to oil, hydraulic, pneumatic and fuel lines, systems or their components that affect their operation or installation and flammability requirements, such as:

- New types of hoses and/or hose fittings which may not meet the installation requirements such as flow rate and flammability requirements.*
- Changes to fuel dump valves.*
- New oil/fuel/hydraulic line materials or sealants.*
- New flammable fluid tanks or system components.
- Change to, or addition of, permanent fuel tanks or fuel system components.*

(5) Changes in fixed fire extinguisher or detector systems that affect the system effectiveness or reliability, such as:

- Relocation of discharge nozzle, detector units or fixed fire extinguisher bottles.*
- Using new or different detector components (including TSO-approved detector in new or existing circuit arrangements).*
- Decreasing the amount or changing the type of extinguishing agents.*

(6) Changes that include the substitution of engine/APU/propeller/airframe materials that affect structural integrity, lightning protection, flight characteristics, or noise/acoustics.*

(7) Any other complex special process that, if not correctly done, has a significant adverse effect on the integrity of the product. *

(8) Major alterations to propellers.**

(9) The following are additional items to the Airworthiness Inspector's Handbook. Installing new systems that affect their operation or installation and flammability requirements, such as:

- Changing or adding permanent fuel tanks or fuel system components.
- Emergency back-up electrical power sources.
- Crew or passenger oxygen systems.
- Auxiliary Power Unit (APU).
- Installing new fire extinguisher or detector systems or changing the type of extinguisher agents.

(10) Novel, unique and/or complex special processes that, if not correctly done would have a significant adverse affect on the safety of the aircraft.

(11) Changes to oil, hydraulic, pneumatic, and fuel lines or systems and their routing.

(12) Installing new landing gear and related components or new brake/brake systems.

f. Crashworthiness. Typical alterations that may appreciably affect this include, but are not limited to:

(1) Changes to the aircraft structure, cabin interiors, or equipment relocation that affect crashworthiness and/or emergency evacuation. This includes initial installation or relocation of seats.

(2) Changes that increase the certificated seating capacity.

(3) Changes that include substituting engine/propeller/airframe materials that affect fire protection, lightning protection, or flammability.*

g. Other alterations requiring an STC or supported by other methods as described in Section 5 above (i.e. Form 337 data approval method or coordinated Field Approval), unless specifically identified by the Administrator as a candidate for the field approval process, include:

(1) Novel or unique installation of new systems or equipment for primary means of navigation, such as heads-up displays, Traffic Alert and Collision Avoidance System (TCAS), autopilots, flight data recorder (FDR), ground proximity warning systems (GPWS), electronic flight instrument service (EFIS), Terrain Awareness and Warning System (TAWS)-A, and Emergency Vision Assurance System (EVAS).

(2) Installing new engine or flight control systems.

(3) Installing new, or modifying existing, icing protection system.

(4) Changes that alter dynamic components of rotorcraft such loads, vibration, fatigue, damage tolerance, flaw tolerance, characteristics of main or tail rotor system, transmission system, gearbox, driveshafts, drive support bearings, main and tail rotor blades.**

(5) Changes to TSO articles that do not meet the minimum standards of the TSO.*

(6) Changes that alter critical or life-limited parts, including engine/APU rotating parts.

(7) Changes that are inconsistent with the required actions of an existing AD. *

(8) Major alterations to systems required for ETOPS of approved aircraft.

(9) Changes that increase the differential pressure limits of an atmospheric or climatic control system of the aircraft and aircraft interior compartments.

(10) Alteration of passenger-carrying aircraft to an all-cargo or combi configuration.

NOTE: * These items could be approved by other means than an STC.
**** Not applicable for this product in this section, but addressed in appropriately identified product section.**

11. REQUESTS FOR INFORMATION. You can obtain additional information, or ask questions about this order, at the Aircraft Certification Service, Aircraft Engineering Division, Policy and Procedures Branch, AIR-110, telephone (202) 267-7184.

12. SUGGESTIONS FOR IMPROVEMENT. Send suggestions, clarifications or comments for improvement of this order to: Aircraft Certification Service, Automated Systems Branch, AIR-520, Attention: Directives Management Officer. You can use FAA Form 1320-19, Directives Feedback Information, to do this. At Internet address www.feds.faa.gov, select "Browse," then select the numerical range of the form.

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Aircraft Certification Division